Interaction of Cocos and Rivera Plates with the Upper Mantle Transition Zone Underneath Central Mexico

Xyoli Pérez-Campos[1,2], Robert W. Clayton[2],

[1] *Departamento de Sismología, Instituto de Geofísica, Universidad Nacional Autónoma de México, Ciudad Universitaria, Coyoacán; Mexico, D. F. 04510, MEXICO*

[2] *Seismological Laboratory, California Institute of Technology, Pasadena, CA 91125, USA*

Supplementary Material

Figure S1. a) Number of RFs per station. The various networks are distinguished (MASE, VEOX, MARS, GGAP, CONA, SSN). The number in parenthesis corresponds to the total RFs obtained for each network. The inset shows the distribution for each network of the semblance percentage between the estimated *Q* component (convolution of RF and observed *L* component) and the original *Q* component. The numbers in brown denote the percentiles 5, 25, 50, 75 and 95. This shows that more than 50 % of our RFs, when convolved with the *L* component reproduce at least 82 % of the observed *Q* component. b) Noise levels. Color shaded areas correspond to the 90 % of the median noise curves for each network. Black lines denote the new high-noise model (continuous) and new low-noise model (dashed) by Peterson (1993). The gray region represents the bandwidth we used for the RFs (0.025 – 0.3 Hz). c) Stacked RFs by ray parameter. Left: Unfiltered. Right: They have been filtered between 0.025 and 0.3 Hz. *P*410*s* (green arrows) and *P*660*s* (orange arrows) correspond to the theoretical arrival of the converted phase *P* to *S* at 410 km depth and at 660 km depth, respectively.

Figure S2. Azimuthal gap per node. It represents the largest azimuthal gap per node. In general, most events come from the SE, SW and NW, having the largest azimuthal gaps to the Northeast. The white line delimits the area within the nodes have an azimuthal gap less than 180°.

Figure S3. a) Position of profiles. b) Profiles along the direction of the slab subduction (1-16). Profiles 2, 4, 9, and 14 are shown in Figure 3. Each RF shows the stack and its confidence interval. The brown areas correspond to the slab according to Yang *et al.* (2009) for profiles 1, 2, and 4, and to Husker & Davis (2009) for profile 9. Brown areas for profiles 5, 6, 7, 8, 10, and 11 denote our interpretation of the position of the slab, given similarities on the RFs with previous profiles. Brown areas in profiles 15 and 16 correspond to areas of cold material in tomography by Li e*t al.* (2008) that might correspond to a broken-off slab. Green areas denote regions of complex RFs. Black dashed lines denote our interpretation for the 410 and the 660. c) Profiles longitudinal to the slab (a-d). Brown area in profile d corresponds to cold material in tomography by Li *et al.* (2008) that might correspond to a broken-off slab. Green areas denote regions of complex RFs. Black dashed lines denote our interpretation for the 410 and the 660.

References

Husker, A. & Davis, P.M., 2009. Tomography and thermal state of the Cocos plate subduction beneath Mexico City, *J. Geophys. Res.*, **114**, B04306, doi:10.1029/2008JB006039.

Li, C., van der Hilst, R.D., Engdahl, E.R. & Burdick, S., 2008. A new global model for P wave speed variations in Earth's mantle, *Geochem. Geophys. Geosyst.*, **9**, Q05018, doi:10.1029/2007GC001806.

Peterson, J. (1993). Observations and modelling of background seismic noise. Open-file report 93-322. *US Geological Survey*, Albuquerque, New Mexico.

Yang, T., Grand, S.P., Wilson, D., Guzman-Speziale, M., Gomez-Gonzalez, J.M., Dominguez-Reyes, T. & Ni, J., 2009. Seismic structure beneath the Rivera subduction zone from finite-frequency seismic tomography, *J. Geophys. Res.*, **114**, B01302, doi:10.1029/2008JB005830.

Figure S1.

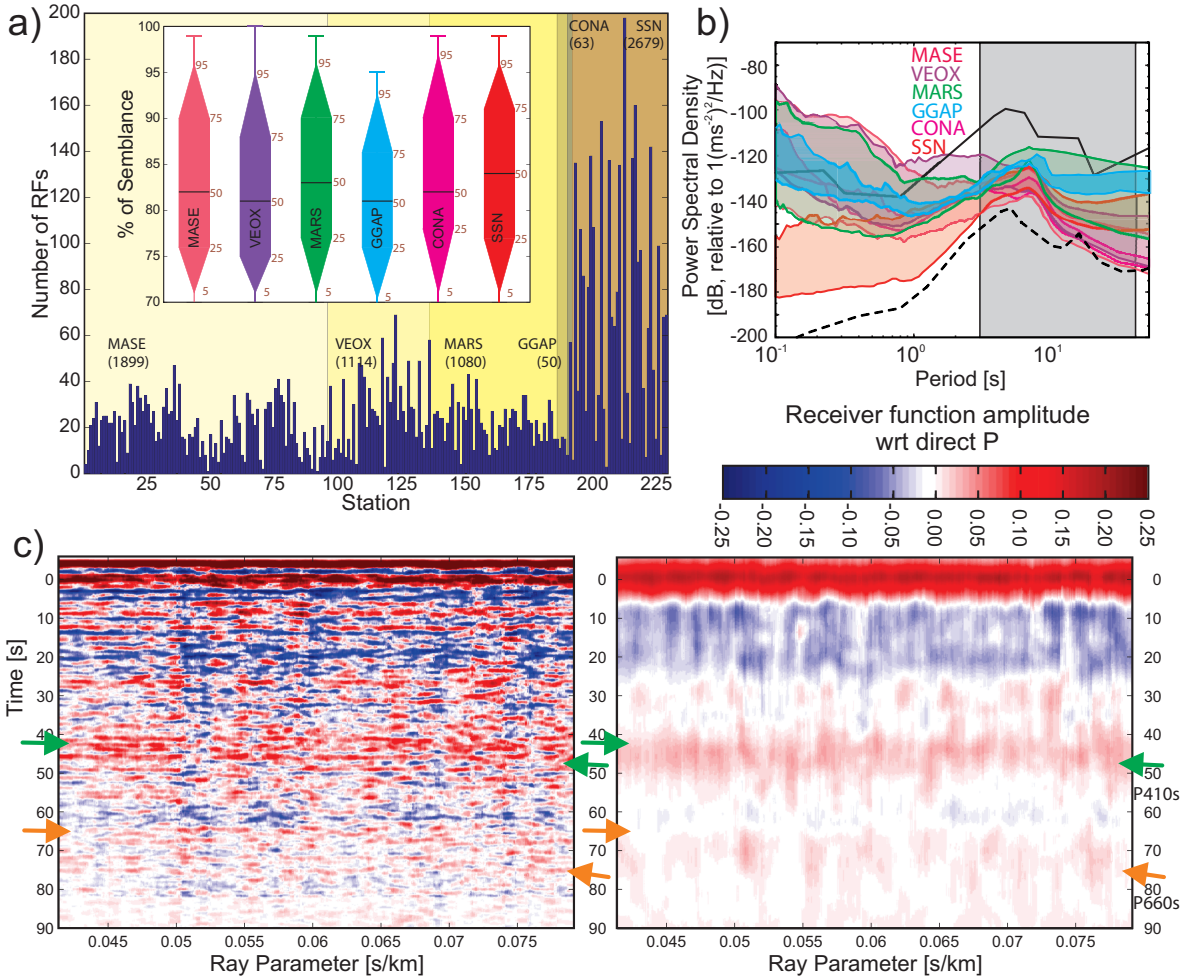
a)
Number of RFs
% of Semblance
MASE
VEOX
MARS
GGAP
CONA
SSN
MASE (1899)
VEOX (1114)
MARS (1080)
GGAP (50)
CONA (63)
SSN (2679)
Station
b)
Power Spectral Density [dB, relative to 1(ms^-2)^2/Hz)]
Period [s]
Receiver function amplitude wrt direct P
c)
Time [s]
Ray Parameter [s/km]
P410s
P660s

Figure S2.

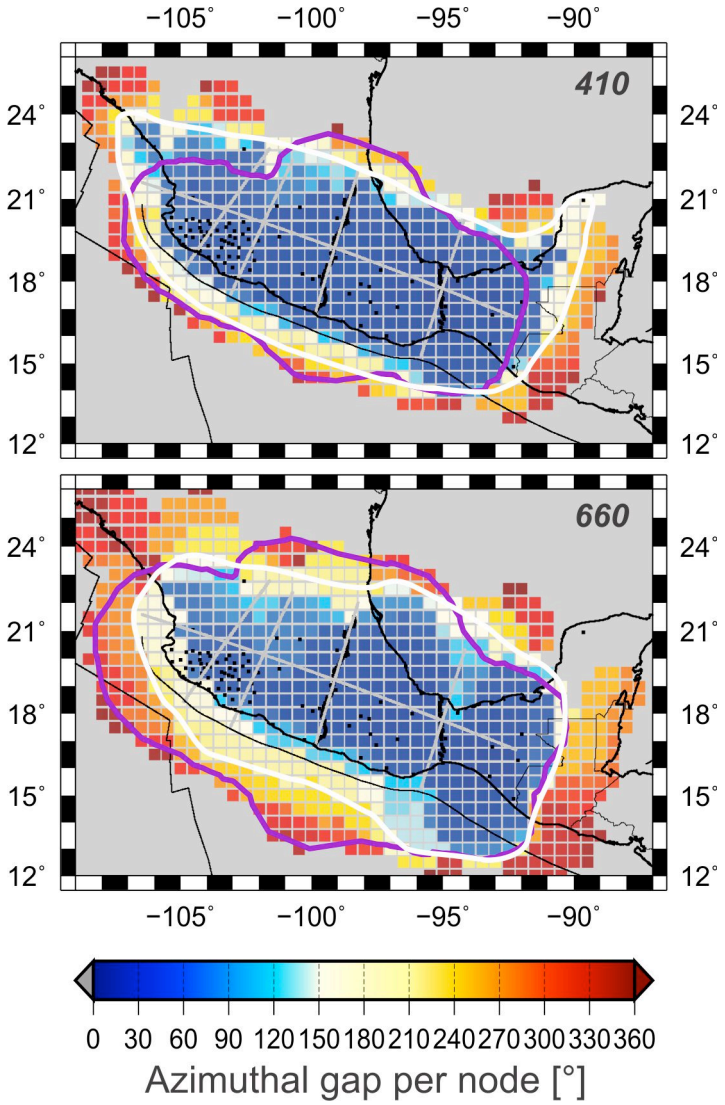
−105°
−100°
−95°
−90°
410
660
24°
21°
18°
15°
12°
0 30 60 90 120 150 180 210 240 270 300 330 360
Azimuthal gap per node [°]

Figure S3.

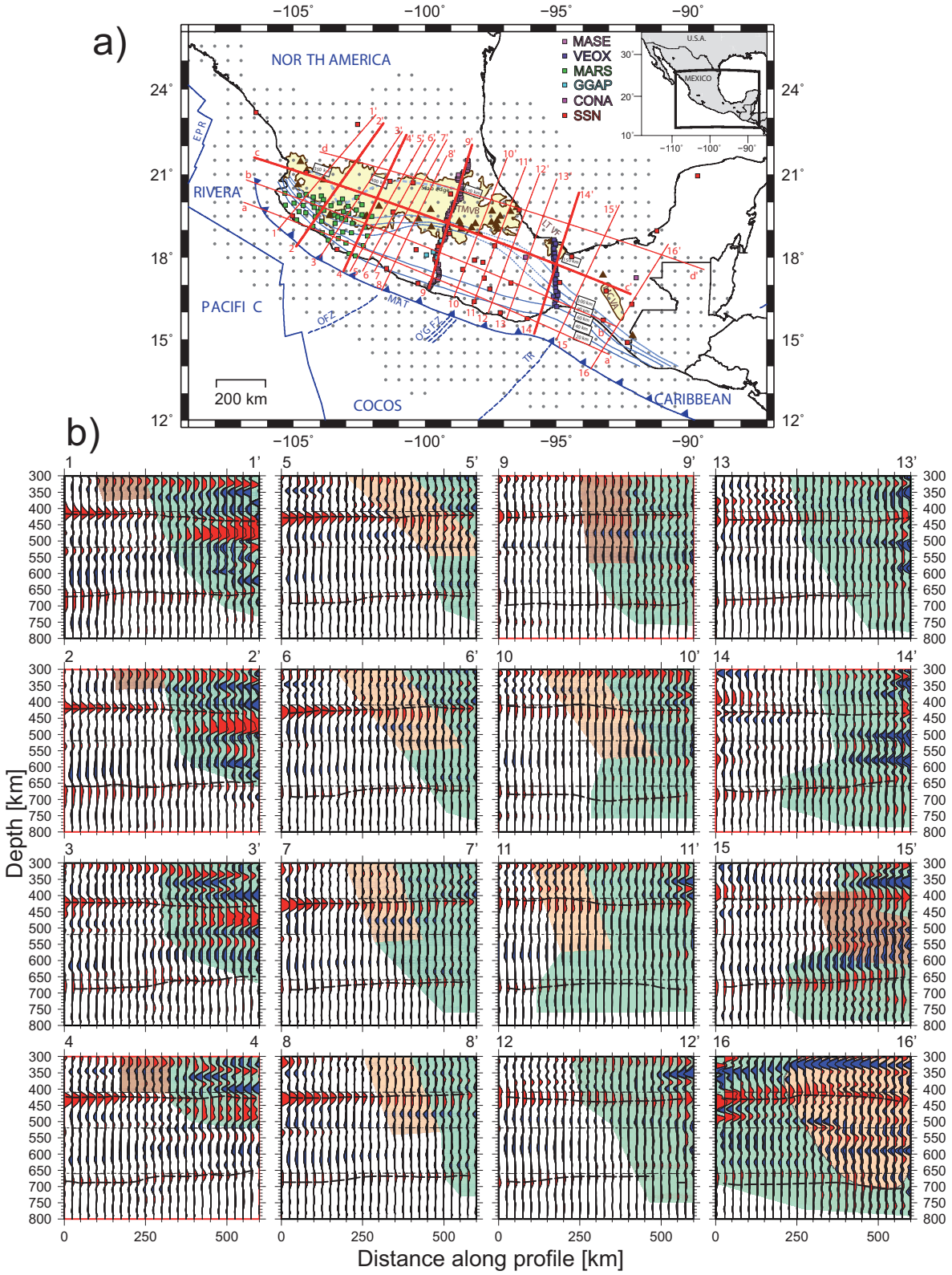
a)
NOR TH AMERICA
PACIFI C
RIVERA
COCOS
CARIBBEAN
MASE
VEOX
MARS
GGAP
CONA
SSN
200 km
b)
Depth [km]
Distance along profile [km]

Figure S3. Continuation.